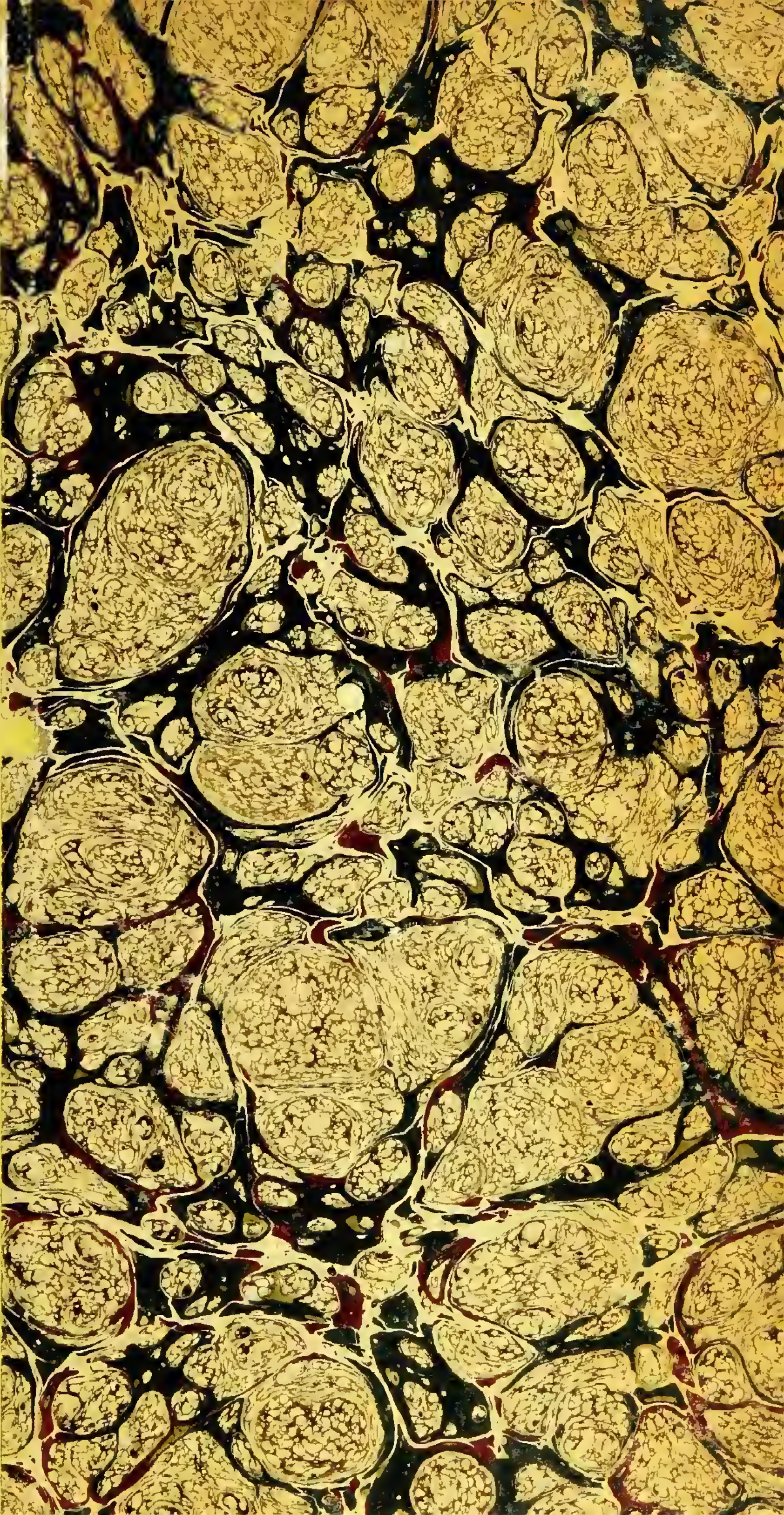

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BOB VEAL AND THE CONSERVATION OF THE MEAT SUPPLY.

BY PIERRE A. FISH,
New York State Veterinary College.

ITHACA, N. Y.

[Reprinted from Proceedings of the American Veterinary Medical Association, 1912.]

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BOB VEAL AND THE CONSERVATION OF THE MEAT SUPPLY.

By Pierre A. Fish,

Ithaca, N. Y.

Why should the tissues of a four or five week old calf be fit for food and those of a two or three week old calf unfit? The only answer at present is that the laws say so. But the laws are not wholly consistent. Although calves four or five weeks of age are legally fit for food in the great majority of the states of the union, they are still unfit for consumption within the state borders of Arkansas and Missouri where a minimum age limit of six weeks is required. The federal law, which formerly required an age limit of four weeks, was changed in 1906 to a minimum age limit of three weeks. The state of Pennsylvania is said to require a similar age limit. Do the inhabitants of Arkansas and Missouri possess better health and greater physical vigor than the other inhabitants of this nation because the veal they consume is more mature? Is the general population of this country any healthier or happier than the residents of Pennsylvania where calves only three weeks of age, half the age of those in Arkansas and Missouri, may legally be consumed for food?

In the majority of the states, where laws pertaining to this subject exist, the favorite age limit for bob veal is four weeks. Is there any particular reason why the majority should favor this age limit? Is there any marked difference in the character of the tissues just before and just after the age limit which determines just when the bob features disappear? If so, why does the change appear one week earlier in the Pennsylvania calves and two weeks later in the Arkansas and Missouri calves? The laws have undoubtedly been imposed arbitrarily according to the judgment of legislators whose ideas of the maturity of the tissues have perhaps depended upon the physical appearance of the meat. Otherwise it would be difficult to account for the three weeks variation as regards age limit.

The object of the law is undoubtedly the worthy one of safeguarding the public health. Has it been shown as yet that the consumption of bob veal undermines the health? Exact data seems to be lacking and it is largely because of the absence of such data that the present investigation was undertaken. Another important reason for the investigation is to determine, if possible, just what bob veal is and in what important respects it differs from what is termed mature veal. Thus far, apparently, inference and prejudice have been the determining factors in imposing the law as regards age limit. If there is a scientific basis for the differentiation of the tissues the law should be based on that or at least upon something more substantial than inference. The usual methods of identifying bob veal are not infallible. The condition of the navel; the distance the teeth have protruded from the gums; and the amount and character of the fat about the kidneys are merely clues and are applicable for only a short period after birth. They can be of little value when the calf is near the three or four week age limit, unless the calf was born prematurely and was backward in development. Even then if the calf has reached the age limit, the law permits its sale for food although its tissues still lack much in the way of development as compared with the normal calf of that age.

The writer has not been able to find anything in the way of literature upon bob veal, but has personal information that some twelve or fifteen years ago Professors Gage and Moore of Cornell University investigated the matter from the histologic side, in an effort to determine some difference in the blood, muscle fibers and structures of other organs of bob veal and older veal. No conclusive differences were found. Shortly afterward the writer attempted to differentiate the tissues of the younger and older veal by seeking to determine if a larger amount of glycogen were present in the muscle fibers of the young veal. The results were not promising and the work was abandoned. Two years ago the work was resumed. It is a well known fact that the tissues of young animals contain a somewhat greater amount of water than do those of the older ones. It was upon this basis that the present work has been done. Three lines of experiments have been carried on: (1) The determination of the freezing point of the meat juices expressed from the tissues. The fewer the solids present the nearer will the freezing point come to that of distilled water which contains no solids. (2) The determination of the specific gravity of the meat juice by means of the pyknometer. (3) The determination of the percentage of water present in a piece of meat of given weight; the weighing being repeated at intervals until a constant weight was obtained.

Of these methods the first or freezing point method was believed to be more sensitive and reliable than the others and has therefore been more frequently used. For the experiments portions were taken from the loin and round as it was believed that these portions were representative of the parts more commonly used for consumption. The calf was killed by pithing and bleeding. The carcass was hung up, skinned and allowed to remain until the next day, when the tissues needed for the experiments were removed. Thus far sixteen calves have been used ranging from one to fourteen days of age. The freezing point of each sample was taken twice and the average of the two used in compiling the statistics. From twenty to twenty-two samples each of veal and beef, purchased in the market, were used for control and for comparison. About two hundred and twenty-four determinations of the freezing point were made upon this material, The most of the material was also subjected to the specific gravity and percentage of water methods. A summary of the results is shown in the following table:

Methods.	Bob Veal.		Market Veal.		Beef.	
	Loin.	Round.	Loin.	Round.	Loin.	Round.
Freezing point	0.9439°	0 9600°	1.0625°	1.0822°	1.06195°	1.080°
Specific gravity	1.0263	1.0281	1.0314	1.0342	1 0315	1 0328
Percentage of water	77.08%	78.43%	75.87%	75.43%	73.66%	71.76%

The averages show that there is a greater correspondence between the market veal and beef than between the market veal and bob veal less than fourteen days of age. The freezing point of the round is depressed somewhat lower than that of the loin. Although the averages show a satisfactory line of demarcation, there are occasional individual exceptions and the method cannot be regarded as infallible. In a few cases the freezing point of the tissues of the bob veal was depressed as low as that of market veal and in a few other instances the freezing point of the tissues of the market veal was depressed no lower than that of bob veal. In a few cases the freezing point of the beef loin was depressed no lower than that for bob veal. In the round the freezing point was generally lower than that for the loin, but here also occasional exceptions occurred. Another exception must be made in the case of the bob veal up to five days of age. Here curiously enough it was found that the freezing point of the round was not depressed so far as that of the loin, but after the fifth day the reverse occurred.

The results show that there is a somewhat larger percentage of water present in the young veal. Aside from this and a deficiency in the amount of fat present, there appears to be no marked difference between the younger and older veal. For food purposes fat may be supplied artificially and the question then depends principally upon the amount of water present. Is water harmful? All food contains a considerable percentage of it. Our own work shows there is only two or three per cent more water present in the young bob veal than in the mature veal, and our results agree very closely with those of other investigators for the calf and beef. For the bob veal we have been able to obtain no other data than our own. Should the use of bob veal as a food be prohibited because it contains a slightly larger amount of water than the mature veal? This would seem illogical when such articles as crabs with 79.97% of water, oysters with 80.5% of water, lobsters with 81.84% of water, perch with 82.6% of water and the flounder with 84% of water in their tissues are considered not only harmless and palatable but are regarded as nutritious and as delicacies and bring good prices in the market. If bob veal were cooked and served at the table, how many could distinguish it from mature veal? Doubtless many have unknowingly eaten bob veal without injury to themselves, who would have disdained to touch it had they known what it was; for bob calves have been and even now, perhaps, are sometimes substituted for veal calves.

Would bob veal be eaten if there were no laws prohibiting its sale as a food? There is in this country a considerable foreign population which has been accustomed to eating veal of this character in the old country. These individuals knew what they were eating and wanted it. They doubtless would still continue to use it if they could procure it. From the standpoint of health and vigor, it must be admitted that they compare favorably with the native population. Others financially poor, who use meat in-frequently or not at all because of its high price, might be expected to use it if reassured as to its harmlessness and its food value. Such veal could be marketed more cheaply and therefore sold for less to the consumer.

In foreign countries the laws relating to bob veal are variable. In England it is said that the calf for the market must not be slaughtered less than two weeks of age, but that the usual age for food purposes is five weeks. In Germany the marketable age of the veal varies with the locality. In the greater number of districts the minimum age limit is placed at from eight to fourteen days, in others four weeks, and still others only a few days. The continued use, in certain foreign countries, of what is regarded here as bob veal, is evidence that serious injury to the health does not occur.

The only way to test the harmfulness or usefulness of bob veal as a food is to eat it. This phase of the question was also included in our experimental work. Seven families, including over twenty individuals, cooperated. The individuals ranged in years from a child of two years to an old lady of over sixty, thus giving a wide range and a fair test as to physical conditions. All of the families knew the character of the meat they were getting. No special conditions surrounded the experiments; the veal was served with the ordinary meals as if it might have been obtained at the markets. A few partook of a portion of each carcass, but as there was not enough to supply all, the remainder took their turns. In no case were any unfavorable reports received. There was no indication of a disturbance of the normal physiologic functions, nor physical deterioration so far as could be ascertained. The veal was wholesome, satisfying, palatable if cooked with pork or other fat to supply the natural deficiency, and apparently as nutritious as older veal. Each family was always ready to receive another supply when a carcass became available.

Thus far the work has been confined to the extreme bob conditions as regards age and immaturity. The specimens used have been from the time of birth, one day, up to fourteen days of age. This should be as fair a test as could be desired for dietetic experiments. It is planned to continue the work from this point up to the legal age of four weeks as indicated by the majority of states having such laws. With the bob veal approaching the legal age limit, it is not unlikely that there will be less divergence as to the freezing point and maturity of the tissues. A sharp line of demarcation is not likely as the processes of growth are gradual and one condition blends into another imperceptibly.

A just law must consider the producer as well as the consumer. In those sections where intensive dairying is carried on, if the calf is of the wrong sex for milk production, or if for any reason it is not desired to rear the calf with the herd, it is economy for the owner to dispose of it early. If it does not pay to raise the animal to the legal age for veal, the owner may kill it and sell the hide for one dollar or less. The carcass may be cooked and fed to the swine and poultry or it may be buried. The disposal of young calves in this manner throughout the country at large is undoubtedly considerable, since there is no market for them and the waste is correspondingly great. The farmer naturally assumes that the flesh is unwholesome since the law prohibits its sale. If he were aware of its harmlessness and had no antipathy to eating young flesh and consumed it in his own family, much of this waste could be avoided.

The situation that confronts us at present is an increasing human population; an increasing cost for the necessities of life and a diminishing meat supply the major portion of which consists of beef and veal. According to the census for 1910, the human population of the continental United States was 91,972,267. The population of the cattle in the United States on farms at that time according to the same authority was 61,803,866. Compared with the census of 1900, it was shown that there had been a total gain in the human population of twenty-one per cent, or that the rate of growth had been on the average two and one tenth per cent per year. Assuming that the same ratio of growth is going on, the present population of this country should be about 95,835,102. In 1900, according to the census, there were 67,719,410 cattle upon the farms in the United States, or 5,915,544 more than there were in 1910, showing a loss in the latter of eight and seven tenths per cent. In other words, while the human population had gained twenty-one per cent during the ten years, there had been a loss of eight and seven-tenths per cent in the cattle population during the same period. The population of the cattle in the United States up to January 1, 1912, according to the bureau of statistics of the United States department of agriculture is 57,959,000. In comparing the figures for 1910 and 1912 it would appear that the estimated gain in the human population is 3,862.-835 or four and two-tenths per cent, while the number of cattle has decreased 3,884,866 or a loss of a little over six and two-tenths per cent. If the cattle had increased during the two years in the same proportion as the human population, there should be 6,440,628 more cattle than now exist. The average yearly decrease in cattle for the ten years from 1900 to 1910, according to the figures of the census was something over a half million per year. If the figures of the United States department of agriculture are correct, there is shown to be an annual decrease for the two years from 1910 to 1912 of nearly two million cattle—an average annual decrease between three and four times as great as existed during the previous decade. These figures show the necessity for devoting some attention to the conservation of the meat supply if meat is to continue as one of the staple articles of diet in this country. According to the bureau of statistics, the per capita consumption of dressed meat in the United States is 185.8 pounds and, in their list, the United States is exceeded by only two other countries—the Australian commonwealth and New Zealand. Statistics also show that the farm value and number of farm animals have not increased and decreased in the same ratio; a diminution in the number has not always been followed by an increase of value, but often by a decided decrease and yet the cost of the meat to the consumer has been just as high or even higher.

In conserving the meat supply it is obviously desired to encourage further production of the meat animals, but aside from that much may be done in considering the matter of veal. It is obviously inconsistent that calves legally fit for food in the various states are unfit in Arkansas and Missouri; that calves three weeks of age are legally good food in Pennsylvania with the sanction of the federal government, but nowhere else where the laws prevail. One of the first and simplest steps in the process of conservation would be the adoption of laws by the various states conforming to that of the federal government. Such laws would bring about uniformity; also less confusion in interstate commerce. The reduction of the age limit to three weeks would be no injustice to the consumer, since it has not been demonstrated that veal of that age is injurious and the test has already been made in Pennsylvania and foreign countries. Such a law, furthermore, would show greater justice to a large number of producers by enabling them to market those calves within a reasonable time which they did not care to raise. A further reduction to two weeks or even one week may, in the course of time, be found desirable. These age limits prevail in many parts of Germany and have for some time. If the food were unwholesome or injurious, it is unlikely that the practice would continue. Finally the sale of bob veal as such may be legalized if properly labeled. As has already been pointed out, there is a certain demand for it and because it could be sold for lower prices the demand for it would undoubtedly grow. One of the chief reasons for our investigation was to test its effect as a food. If persons in the tender age of childhood and those well along in years felt no injurious effects from its use at occasional intervals over a period of two years, we may reasonably feel justified as to its harmlessness, if proper and similar sanitary precautions be taken with it as with other meats.

It is our opinion, therefore, that a considerable step in the conservation of the meat supply of this country will have been taken, if uniform laws might be established, in harmony with that of the federal government, reducing the marketable age of veal calves to three weeks; if the sale of bob veal properly labeled as such might be legalized, so that those who may desire can purchase it; and finally that the considerable waste on the many farms in this country may be checked, by extending the information to the farmers that the flesh of bob calves is not only harmless, but wholesome and, in the absence of a legal market, may properly be used upon their own tables for food.

DISCUSSION.

Dr. Mohler: The paper which has just been presented by Dr. Fish is certainly a very important one and deserves the closest attention. There seems to me to be two sides to the question of the consumption of bob veal; one is the esthetic side and the other the hygienic side. I will not discuss the hygienic side because my assistant, Dr. Berg, is conducting an independent investigation along this line, and I do not care to anticipate his results. From the esthetic viewpoint, I sincerely doubt whether the American public is ready and willing to purchase bob veal as such. There is one serious objection to labeling such meat "bob veal," as Dr. Fish suggested in his conclusion, and that is the wide range of meaning this term may have, as for instance a two days old calf and a twenty days old calf would both be "bob veal." Sworn evidence has been presented to show that not only the carcasses of calves two or three days old have been illegally put on the market by unscrupulous dealers, but slunk calves as well and it is quite impossible after the latter have been appropriately dressed to detect this fact, not knowing the history. Therefore, I think it necessary in labeling such meat to go farther than merely to call it bob veal; for if bob veal is to be marketed the age of the calf should appear in addition. The three-week age limit has been referred to as an arbitrary ruling but it has this advantage: it is much easier for an inspector to tell the age of a calf under three weeks old than it is between three and five weeks for instance. Now I would be willing to consume veal say a day younger than three weeks, but I would not knowingly eat veal of the age mentioned in the paper. A line must be drawn somewhere and when we reduced the age limit six years ago from four weeks to three weeks considerable adverse criticism was evoked.

The American consumer, as we know, is a fastidious consumer. As an illustration, it is well known that the people of Boston demand eggs of a brown color, while the New York people prefer white eggs. I have a friend in California who owns a large herd of Angora goats. He is also the proprietor of a newspaper, and several years ago became very anxious to have his kid meat sold on the market as kid meat. This meat was being sold right along by the local butcher as lamb and the unsuspecting buyers bought it and relished it under the impression that it was lamb. The breeder made arrangements with the butcher who was handling the kid meat to advertise it in his newspaper without charge, and he did so, but it was only three weeks before the the butcher was obliged to go out of business. Nobody wanted to eat kid meat as such, although for three years his customers had been consuming it with a great deal of satisfaction when it was sold as lamb or mutton.

Not more than a year ago a bob veal case was brought up in the courts of the District of Columbia when the inspector of the health office prosecuted a butcher for the sale of bob veal. He presented his case, described what the literature of the day gives on the subject, and mentioned the symptoms of people made ill by consuming such meat. But the case went against the inspector as the judge decided in favor of the butcher. Several days later the judge ate some veal for his evening meal and attributed an illness which followed to its consumption. Sometime after recovering he met the district inspector on the street and told him if he brought any more cases such as the recent one he would be glad to reconsider his decision, because he had experienced the same symptoms after consuming immature veal as the inspector had described on the stand.

I agree with Dr. Fish with reference to the lack of uniformity, not only between the laws of the various states, but between the laws of different municipalities. The absurdity of certain cities and states having a six weeks limit, others four weeks and still others three weeks, is apparent. By eliminating calves under three weeks of age from the market we eliminate a great many that are affected with various diseases and thereby decrease the danger to the consumer of meat. The experiments of Winzer show conclusively that the bacteria which produce meat poisoning in man are more prevalent in young calves than in older calves, the number gradually decreasing with the increase in age. If we keep the limit at three weeks we will get rid of a great many of the diseases which we would not eliminate if the age limit is lowered.

Dr. Gill: The amount of fat in bob veal determines the quality rather than the age, and I have yet to hear from anyone who should know, that uncontaminated bob veal of good quality, is generally unwholesome or unfit for human consumption. My experience has been that bob veal decomposes sooner than matured meat and it is my opinion that from the time of slaughtering, it should be shipped and kept at a temperature no higher than fifty-five degrees Fahrenheit until it reaches the consumer.

The laws regulating the sale of veal should be made uniform. At the present time the laws of the state of New York demand that no calf meat shall be sold unless it was at least four weeks of age when killed, while the federal law is three weeks. The law is positive and does not give discretion to inspectors as to the quality of the veal except when diseased or foul. Except for the conservation of the milch cow, this bob veal question is one of meat inspection only.

Dr. Mohler: With reference to Dr. Gill's remarks, I certainly think it would be improper to attempt to determine the age of a calf by the appearance and condition of the fat. The most accurate way of ascertaining the age of a calf is by the umbilical cord. The stump dries in the first four to six days and drops off within two weeks, leaving a moist surface which soon scabs over and this scab generally falls off inside of the fourth week. Any inflammatory process which interferes with this normal procedure is readily apparent and must be given due consideration. Of course it is impossible to tell within a few days of the age but if the calf has an umbilicus hanging to it you can be pretty sure that the animal is under three weeks of age. Various works on meat inspection speak of the appearance and eruption of the teeth, the formation of the horns, the condition of the arched pad on the hoofs and the ossification of the bones in establishing the age of calves, but when it comes to a practical test the umbilical cord and the scab which follows will be found to give the most accurate results.

Dr. Moore: I would like to refer a little more in detail to a matter mentioned by Dr. Fish, that of work done by Professor Gage and myself some years ago. We have a law in New York requiring an age of four weeks. In order to render service to the department and also ascertain from the biologic side whether we could determine the age we made a very careful histologic study and microscopic examination of the blood and all the tissues. We also made an examination of calves that were killed at different ages. Through the cooperation of the department in Albany we secured calves from two days up to about five weeks. They were all slaughtered and we had an opportunity to make a very careful post-mortem examination of these animals. The outcome of it was that absolutely nothing that was being used as positive evidence in suits in regard to age of calves could be relied upon, absolutely nothing. In some calves two days old we found the teeth as much advanced, the ossification as much advanced, as in others that were four weeks old. The only positive evidence we found was the umbilical cord. We found if the calves had been healthy this cord disappeared practically in fourteen days. If this cord was on and the calf was normal we decided it was under two weeks. Of course a slight infection might change that to a certain extent.

We had in the state senate at that time a man who was very emphatic against bob veal. He was chairman of the public health committee. I had occasion to be in his locality and was introduced to him by a man having charge of the veterinary work and having a good deal to do with bob veal. I asked the senator why the law was made and enforced. He went on to state that they did not want bob veal, and so on. I asked him how he was going to tell whether it was bob veal or not. He said, "You can tell by the size." I had to differ with him. Then he said, "You can tell by the teeth." I said that could not be done. He said "You can tell by the length of the hair and the hoof." I had to differ with him again. He enumerated a number of other ways and finally said, "Why, I want to tell you that any damn fool can tell bob veal!" And that is about the basis of our legislation in regard to this subject.

It is said that people sometimes become sick after eating bob veal. That is undoubtedly true in a number of cases. Some people cannot eat lobsters without becoming sick; some people cannot eat a great many other things without having them disagree with them. It is true that probably many persons cannot digest good veal. Here is the tendency. You see it in milk and in everything. If a person is sick the American public wants to find out the cause. If the individual who is sick has eaten veal, why, it is veal that caused the sickness. Maybe it was veal and maybe it was not. So I think that we have to consider the tendency of the individual, these assumptions, of which medical literature are so full, are very few of them positively established.

In regard to the enteritis organisms and diarrhea in calves. It would seem to me that the calf, which in most cases is born healthy, if killed at the age of three days, before it gets sick, is infinitely safer from that point of view than the calf that is three weeks old and has had a profuse diarrhea for two weeks. I have seen calves, many of them, that have had diarrhea for two or three weeks and were then killed. They were killed at the limit of the time period and sold for food. Now if there is anything in regard to diarrhea that is going to cause the flesh of that calf to be unwholesome it ought to produce it at that time. I do not see that the three weeks limit helps that at all.

The calf that is two or three days old may contain more of these organisms. They have umbilical infection many times. This enteritis is perhaps a normal habitat of the bovine species and is fairly prevalent perhaps in the environment of cows and the calves would naturally become affected by it. If a calf is killed before these organisms have a chance to multiply I fail to see why it is not as safe or safer than when killed at the climax or at the end of this severe diarrheal period. These are questions that are important, and I think it is a disgrace, the testimony that is given in our courts in regard to the wholesomeness or the unwholesomeness of bob veal. Many things are sworn to by veterinarians without any facts whatever to base their judgment on. With the continual decrease of our meat supply it does seem to me, in spite of all this talk about the unwholesomeness of bob veal, that there is no reason why the law should prevent one from selling a calf two or three days old to a neighbor to eat if he wants to buy it. If I do that today I commit a misdemeanor; but I do not see any physiologic or hygienic reason why I should not do it. I think the time will come in this country, as it is in Germany, when it will be done. I hope the time will never come when it will be sold as veal. Dr. Fish does not believe in that, but he believes, and I believe, if people want this young calf flesh they should have a right to buy it.

The question of the disease of the calf, of course, must be safeguarded in some way; but it is not safeguarded in our own state, at least at the present time. We are not protected against these diarrheal conditions in the calves, and they do occur many times. I heard Dr. Williams tell the other day of calves he saw going to the market suffering severely from diarrhea.

DR. MOHLER: I would like to ask why the calf you refer to as having had diarrhea for two weeks should not be condemned by the inspector, not because it is bob veal, but because of the conditions found in the post-mortem examination?

DR. MOORE: For the very good reason that there is no inspection; it is left to the conscience of the butcher. We have inspection in certain places, federal inspection in interstate trade, but there is no inspection where a great many of these calves are killed.

DR. MOHLER: I am referring entirely to where inspection occurs, federal, state or municipal.

DR. MOORE: I think that condition will be met when we have proper municipal and state meat inspection. At the present time we do not have it, and under present conditions we continue to suffer as much from these diseased calves at four or three weeks old as we would if they were sold earlier. Not that it is right; I am not justifying it at all; but I am pointing out that many calves three weeks of age are killed during the course of the disease.

DR. MOHLER: If there is no inspection there is no discrimination between bob veal and the mature calf; who is to tell whether it is bob veal or a mature calf?

DR. MOORE: There is no one to say. The point I wish to make is that on that ground I do not see why you should discriminate more against the two weeks' calf than the three weeks'. My contention is that the meat is as bad, and in many cases worse, if the calf is killed at three or four weeks while suffering from the disease than if killed before it had the diarrhea. Unfortunately in New York, and I think it is true of a great many other states, we have no inspection and these calves do get to the market. I think nobody can question the fact that a great many calves are killed that are under the legal age. The doctor and myself do not differ in regard to that at all, except he is pointing out places where the meat is inspected and I am referring to places where the inspection does not exist.

DR. MARSHALL: We have considerable trouble with bob veal in Pennsylvania. There are sections in our state where people do not care whether veal is one day old or six months old. This is especially true in some of the mining sections where the foreigners are willing to buy veal of any age. We have an old law in Pennsylvania which aims to prohibit selling veal under three week sold, but the fine is very low. In 1909 a law was passed, making it a misdemeanor to sell immature, unwholesome or unhealthful veal, and under this law the fine is more severe.

We have ten regularly employed meat hygiene agents in Pennsylvania, and the matter of condemning bob vail is left to their opinions. If one of them finds veal which is unfit for food he condemns it and prosecutes the offender.

The American Humane Society has a bill before congress at the present time which aims to prohibit shipping immature calves to market. It should be considered cruelty to animals to ship young calves and have them on the road from three to four days without food.

DR. JACOB: If a calf is four or five weeks old and is not accompanied by a considerable amount of adipose tissue that calf should not be passed for food.

DR. FISH: From the esthetic standpoint there is no opportunity for discussion, because no law can be passed to compel people to conform to certain standards in that respect. My own work was rather along economic lines, because I feel we will soon face, if we have not already begun to face, a real crisis in the matter of the meat supply of the country. I was rather startled in looking over statistics, in preparing this paper, to find that the last United States census shows only about one-half as many calves listed as in the previous census. What Dr. Mohler said in regard to kids and lambs emphasizes the point I think I referred to in the paper, that tissues are acceptable esthetically perhaps when they are known under another name; but as to the question of quality, it would prove the point that the tissue should be just as harmless under one name as another. It is so with bob veal; there are some, probably, who would eat bob veal without any qualms at all if they did not know it was bob veal who would not eat it under any consideration if they knew just what the tissue was.

Now in regard to the instances of unpleasant results or sickness caused by the use of bob veal. May it not be difficult to *prove* that it actually does come from bob veal? In many parts of Germany what we term bob veal is offered in the market. In one instance a family went to the market, purchased some bob veal and after consuming it were taken sick. All who partook of the meat became very sick. The general tendency was to condemn the bob veal, but there was an inspectator in that district who was of a very thoroughgoing character and upon investigating the matter he found out where other cuts from the carcass had been sold, traced them and found that no others who ate of the meat were affected apart from this particular family. Apparently the trouble was that the meat had become contaminated after it had left the butcher's shop.

With regard to young animals and the diseases associated with them, the conditions there perhaps work both ways. There are some facts that may point to a condition that young calves are not so susceptible to certain diseases as others. I was told a while ago by one who was on the killing floor that it was less common to find diseased tissues in young calves than in the older ones. Now the question is as to whether the tissues of bob veal are more susceptible to pathogenic organisms than the older tissues. I am aware of the fact that such statements have been made, general statements and inferences, so far as I know. That is one of the questions I think ought to be determined by actual tests. A great many statements with regard to bob veal have been made in a general way and without scientific basis.

It may be a fact that the tissues of bob veal are more susceptible; that they form a better pabulum for organisms than older tissues, because they contain a larger percentage of water. Fluid, of course, is essential for the growth of organisms. The tissues of fish or oysters, on this ground, should be a very excellent pabulum. I might say my own reason for taking up the work is that, so far as I can find, the general statements in regard to the question are inferential. I was not able to find anything at all that I can remember that was based upon scientific facts, and I wanted to settle some of these points, if I could, one way or the other. I was more or less prejudiced against bob veal when I undertook the work; but I feel that I must be governed by my own observations and what I think are the facts in the case, as presented in the paper.

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BOB VEAL AND THE PUBLIC.*

BY PIERRE A. FISH, ITHACA, N. Y.

In the consideration of bob veal, the question of primary importance is whether or not it is unwholesome as a food. The law in prohibiting its sale encourages such a belief. Its purpose is to protect the consumer, but a just law must also consider the interests of the producer. With an increasing population and diminishing cattle supply, the time is not far distant when serious attention must be given to the conservation of the meat supply. With an increasing demand for pure food and a growing number of veterinarians as local inspectors for meat and milk, there should be some knowledge as to any definite nutritive value possessed by bob veal.

In those countries in which meat is most used as a food there has been the highest development of the livestock industry. The food question has, therefore, given a special impetus to the breeding and feeding of stock which will excel in the quality and flavor of the meat. In earlier years age was considered one of the important factors when it came time for slaughtering. At the beginning of the nineteenth century the standard of perfection in the United States and England was the steer of five or six years of age. Even in the early eighties a steer was not deemed mature or profitable enough for slaughter until four or five years old and was of large size and weight. Since 1891 finished steers more than three years of age have been the exception rather than the rule on the markets, while two-year-olds are gradually becoming the maximum. With the reduction in age came a reduction in size, which brought out as the butcher's ideal the "pony" beef, the animal weighing from 1,200 to 1,400 pounds when fully finished. "Pony" beef was eventually followed by "baby" beef—practically a pony steer finished at a younger age.

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* The substance of this paper was presented at the Conference for Veterinarians at the New York State Veterinary College, Ithaca, N. Y., and at the Meeting of the Pennsylvania State Veterinary Medical Society, at Philadelphia, Pa.

Baby beef has been defined as a prime butchers' beast, thoroughly fattened and ripe for the block at from 12 to 24 months of age. Growth has been artificially promoted by continuous heavy feeding from birth, with the object of obtaining in the shortest time possible the maximum amount of well-matured beef. With the cattle put on the market at two or three years of age, the greater part of the life is devoted to natural growth, but the last four or six months of life is devoted to fattening. With the baby beef the fattening process is begun at birth and carried on coincidently with growth. Under such conditions it is necessary that all the food that can be transformed into beef must be supplied.

This reduction in the age of beef fit for slaughter, although not, perhaps, regulated by law, is referred to because there is also apparently a tendency to reduce the age at which veal may be put on the market. The Federal government formerly required that a calf must be four weeks of age in order to be marketable. This age has now been reduced to three weeks. The States of New Jersey and Pennsylvania have also adopted the three weeks age minimum. In other States the age ranges from four to six weeks.

In Germany the marketable age of veal sanctioned by law varies with the locality. In the greater number of districts the minimum age limit is placed at from eight to fourteen days, in others four weeks, and still others only a few days. In England the calf for the market must not be slaughtered less than two weeks of age, although it is said that the usual age for food purposes is five weeks.

The usual method for determining a bob veal before the carcass has been cut up is the unhealed condition of the umbilicus or navel; the distance the teeth have protruded from the gums is sometimes an aid; the amount and character of the fat about the kidneys—renal fat; in very young animals the fat is not so great in amount and is perhaps of softer consistency, having quite often a glandular appearance and usually of a brownish instead of a white color. Size and weight may be of indirect assistance, but they are so variable that they cannot always be depended upon. In fact, all of the conditions mentioned are more or less variable and serve rather as clues than indisputable facts. The healing of the umbilicus may be delayed and the development of the teeth and renal fat retarded.

The writer has been unable to find any literature upon this subject, but has information that some twelve or fifteen years ago Professors S. H. Gage and V. A. Moore, of the New York State Veterinary College, investigated the matter from the histological side in an effort to determine some difference between the blood muscle fibres and structures of other organs of bob veal and older veal. No conclusive differences were found. A little later the writer attacked the problem in an endeavor to determine if there might not be a greater amount of glycogen present in the meat of the younger than in the older veal. The results were not promising and the work was abandoned. Two years ago the work was taken up again on the basis of the amount of water present in the tissue. It is a generally conceded fact that the flesh of young animals contains a greater percentage of water than does that of older ones. It is on this basis that the present work has been done. Three lines of experiments have been carried on: (1) The determination of the freezing point of the meat juices expressed from the tissues. The fewer the solids present the nearer will the freezing point come to that of distilled water, which contains no solids. (2) The determination of the specific gravity of the meat juice by means of the pyknometer. (3) The determination of the percentage of water present in a piece of meat of given weight. The weighing was repeated at intervals until a constant weight was obtained.

The parts used were from the loins and round. The beef and mature veal were purchased in the market. Experiments have been performed upon 16 bob calves and from 20 to 22 samples of market veal and the same number of beef. In all 115 determinations have been made of the freezing point of the various specimens and a lesser number of observations made upon the specific gravity of the muscle juice and the percentage of water present. Of these three methods the freezing point seemed to be the most sensitive and reliable, and greater attention has been devoted to that. The freezing point of each sample was determined twice and the average of the two determinations was used in compiling the statistics. In comparing the averages of the three series of meats there is found to be a difference of from 0.10° to 0.11° between the bob veal up to 14 days of age and the market veal and beef. The results show much closer harmony between the market veal and beef than between the market veal and bob veal (less than two weeks of age).

In all three series of meats the averages showed that the freezing point of the round was depressed 0.01° to 0.02° lower than that of the loin. The curious fact was observed that in the bob veal up to five days of age this did not hold true. Up to this age the loin showed a lower freezing point than did the round, but from the age of five to fourteen days the reverse was the rule. The following table is a summary of the results obtained up to the present stage of the work:

	Bob Veal.		Market Veal.		Beef.	
	Loin.	Round.	Loin.	Round.	Loin.	Round.
Freezing Point	0.9572°	0.9716°	1.0625°	1.0822°	1.06195°	1.080°
Specific Gravity	1.0263	1.0281	1.0314	1.0342	1.0315	1.0328
Percentage of Water	78.87%	78.97%	75.87%	75.43%	73.66%	71.76%
	(Five specimens)					

The investigation has been carried on with the idea of obtaining as definite data as possible for differentiating the tissues of the bob from older veal. Thus far in the work no calf older than 14 days has been used. Although the table shows that the averages of the experiments indicate quite a satisfactory line of demarcation between the younger bob and older veal, there are occasional individual exceptions, and the method as yet cannot, therefore, be declared infallible.

Although a method which would distinguish the tissues of the bob from that of the older veal with some degree of positiveness would undoubtedly be of great value in aiding the enforcement of the law, the centre of the whole question is whether or not the tissues of bob veal are really unwholesome as a food and if the body functions are in any way disturbed thereby.

It is obvious that the only way to settle such a question is to eat bob veal. Dietetic experiments have, therefore, been carried along with the preceding portion of the investigation. Seven families, including over 20 individuals, have co-operated at various times in this portion of the work. The ages of these individuals ranged from two to sixty years. No report of any disturbance of the physiological functions was received. The statement that the flesh of bob veal has a laxative effect and induces diarrhœa has not been confirmed in a single instance throughout our work. The health in all cases was apparently normal; nor did any family refuse a second helping when another carcass became available.

In all veal there is a deficiency of fat as compared with beef. In bob veal this deficiency is naturally somewhat more pronounced because fat is a result of growth and age under proper nutritive conditions. In the use of bob veal this deficiency may be overcome to a considerable extent by cooking the veal with pork or other fat. The fact that persons are arrested at times for attempting to dispose of bob veal would indicate that the law is, without much doubt, sometimes evaded. Persons have undoubtedly eaten bob veal unwittingly who would have disdained to touch it if they had known in advance what it was. The investigation thus far has shown that the tissues of bob veal do possess a somewhat larger percentage of water than do those of mature veal. Is it logical to condemn the use of bob veal as a food on this ground, when we consider as delicacies certain fish, lobsters, oysters, etc., all of which possess a higher percentage of water than even bob veal, and bring a higher price in the market?

Is there a demand for bob veal? In all of the larger and many of the smaller cities of the East there is a considerable foreign population. Many of these persons have eaten bob veal in their native homes; they knew what they were eating and wanted it; they would still eat it if it were available. From the standpoint of health and physical stamina they compare favorably with our native population who have not eaten this veal. Others, financially poor, upon whose tables meat seldom appears, would in time come to use it if reassured as to its wholesomeness. Bob veal should be marketed and, therefore, retailed at a lower rate than older veal.

The economic side of the question is of great importance to the general public, for it involves the conservation of the meat supply. Since 1890 the population of the continental United States has increased 41.7%, while that of cattle has increased only 30.8% during the same period. The statistics for the more recent years show a still greater divergence, although the cost has increased.

The honest farmer who carries on intensive dairying and does not find it profitable to raise all of his calves to maturity, or if the sex of the calf does not permit it to produce milk, must suffer considerable loss. The skin of the calf may perhaps be sold for a dollar or less, but the law prohibits the sale of the carcass for food purposes. Naturally, the farmer infers that the flesh is unwholesome. If the butcher may not be allowed to sell it to the public to eat, the farmer and his family are not likely to consider it a proper food for themselves. The result is that the carcass possessing a certain nutritive value, as far as proteids are concerned, is thrown away or cooked up and served to the swine or poultry for food. The waste in this respect must amount, in this State, to a number of thousand dollars. Much of this might be saved if the farmer were sufficiently aware of the nutritive value of the material and utilized it as food in his own family. In the country as a whole the aggregate must be large. Such a waste is serious in connection with a diminishing beef supply.

Diseased conditions are less commonly found in the young as compared with the older animals, and where meat inspection is not practiced the probability of eating diseased tissue is less likely than when older animals are consumed. If it came to the question of eating healthy young tissue or diseased older tissue, there should be but one answer. According to the late Dr. Pearson, the Federal government spent $3,000,000 in 1907 for meat inspection. At the present time the amount is probably not less than that sum. If the people of this country contribute the above amount, then New York State, with about one-tenth of the total population, contributes $300,000 for this purpose, and only about one-half of the meat consumed is thus inspected by the Federal government. The half that is not inspected probably needs the inspection more than the half that is. Municipal or local inspection should by all means supplement that of the government.

The reduction of the killing age of beef has been referred to. Why not extend it to veal? As a first step in the conservation of the meat supply it would appear desirable to reduce the marketable age of bob veal to three weeks, as already sanctioned by the government and the State of Pennsylvania and New Jersey. There should be uniformity in the various States having laws upon this subject. The reduction of 25% in the age limit would check a large amount of waste in those States which require an age of four weeks or more. Under the present arrangement various absurd conditions may arise. A healthy calf three weeks of age is legally fit for food in the State of Pennsylvania; if carried across an invisible line into the State of New York it is condemned as unwholesome. What miraculous physiological changes must have occurred in the tissues of the animal while crossing the line. Natural law is apparently subsidiary to State law.

In time, as the conservation of the meat supply becomes more imperative, the age may be reduced to one or two weeks, as in the case of the greater portion of Germany. Certainly the Germans may be regarded as holding their own in health and stamina, although they consume a large amount of what would be classed in this country as bob veal.

Another step in checking this waste and safeguarding the supply would be to legalize the sale of bob veal as such. To substitute it for mature veal would be illegal, but since there is a demand for it, with the prospects of future growth, why not supply it plainly labeled to those who may desire it? While it might not entirely check, it would undoubtedly very much reduce the attempts to substitute for older veal.

As to the charges of unwholesomeness and injurious effects upon the human system, it would appear that the burden of proof should rest upon those who make them. Our own investigation, with the co-operation of more than twenty persons, including the tender age of childhood and advanced maturity, do not confirm them, but rather indicate that the flesh of bob veal has a definite nutritive value and appears in no way to interfere with the normal physiological functions of the human body.

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FURTHER OBSERVATIONS ON BOB VEAL

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BY

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FURTHER OBSERVATIONS ON BOB VEAL.

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In the preliminary paper published last year,* attention was called to facts of historical, legal, nutritive and economic interest. The samples then examined were necessarily somewhat restricted in number. Up to the present there has been a total of sixteen bob calves and from twenty to twenty-two specimens each of market veal and beef examined. As samples were usually taken from two regions — the loin and round, something like 115 determinations have been made of the freezing point and a lesser number of observations made upon the specific gravity of the muscle juice and percentage of water present.

Of the above-mentioned experiments the determination of the freezing point of the tissue juice seems the most promising. A Beckman's thermometer, graduated to 1-100 degrees, has been employed. The fineness of the division of the scale has made it possible to utilize 0.01 of a degree as the unit of calculation throughout the experiments. The freezing point was determined twice for each sample and the average of the two tests was used in compiling the statistics.

The averages of the three series show that there is a difference of from 0.10 to 0.11 between the bob veal up to fourteen days of age and the market veal and beef. Occasional exceptions occur. In the sixteen specimens of bob veal, there were three samples each of the loin and round found, in which the freezing point was depressed far enough to rank with that of the market veal and beef.

In the market veal there were four out of the twenty specimens of the loin and two out of the twenty-one specimens of the round which showed a freezing point so slightly depressed as to class them with the bob veal. In the beef, six out of twenty samples of the loin and none from the round showed a freezing point similar to that of bob veal.

In all three series the averages showed that the freezing point of the tissue from the round was from 0.01 to 0.02 lower than that of the loin. In the case of the bob veal where the samples from the loin and round came from the same animal, the interesting fact was observed that the freezing point of the "round" tissue was less than that of the loin up to five days of age. From five days to fourteen days of age, the freezing point of the "round" tissue was depressed lower than that of the loin except in the case of one specimen ten days of age, in which the freezing point of the loin tissue was depressed 0.017 lower than that of the round.

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* **Preliminary Observations on Bob Veal. Report of the New York State Veterinary College for the year 1909–1910.**

In the case of the market veal and beef, the samples of the loin and round probably did not come from the same animal as in the case of the bob veal. There was, therefore, greater fluctuation in the freezing point of the two tissues. This was more noticeable in the beef than in the market veal, but in each series there was distinctly a greater number of "round" samples with a lower freezing point than loin.

The fact that six of the twenty samples from the loin of the beef gave freezing points similar to that of bob veal was somewhat unexpected. It may be explained, possibly, on the ground that in this tissue there is a larger proportion of water to the solids than there is, for example, in the round. The loin is one of the tenderest, juiciest and most sought-after portions of the carcass, and because the muscular tissue here is not subjected to as severe work as that of the round a larger proportion of water may be present and the tissue does not develop the toughness that other regions do which undergo more active exercise.

In the case of the bob veal, as already noted from the freezing point, there is apparently a larger proportion of water present in the round up to the fifth day of life; after that there is less than there is in the loin. This fact may, perhaps, be explained on the ground that for a short time after birth the calf, as a rule, is not very active with its limbs, but with increasing activity of the limb muscles as compared with the loin, there is a decrease in the proportion of the water present.

The greater the proportion of solids present, the more is the freezing point depressed. This is well shown in the diagrams of Plate I. In the majority of the samples of each series the freezing point of the "round" is depressed further than that of the loin, although there are occasional exceptions. If 1.0 degree below zero be taken as a standard for comparison, it will be seen from the diagrams that in the case of the beef round that the freezing point of every one of the twenty-two samples was depressed lower than 1.0 degree; while in the case of the loin the freezing point of some of the samples was not depressed so far as 1.0 degree. In the case of the market veal it is shown that out of the twenty-one samples of the round all but two were depressed more than 1.0 degree; while out of twenty samples of the loin there were four which were not depressed so far as 1.0 degree. In the sixteen specimens of bob veal, the freezing point was depressed lower than 1 degree in only three instances in case of the loin and round respectively.

The following tables show the series of the freezing point, specific gravity and percentage of water in the bob veal, market veal and beef:

Bob Veal — Freezing Point.

No.	Age.	Loin.	Round.
2	1 day (20 hours)	–0.923°	–0.894°
1	2 days	–0.933°	–0.913°
11	3 days	–1.011°	–0.9535°
3	4 days	–0.965°	–0.959°
8	4 days	–0.972°	–0.942°
12	5 days	–0.970°	–0.976°
4	6 days	–0.924°	–0.9855°
9	6 days	–0.9345°	–0.962°
10	7 days	–0.950°	–0.964°
5	8 days	–0.795°	–0.826°
14	9 days	–0.951°	–1.0085°
15	10 days	–0.935°	–0.918°
7	11 days	–0.849°	–0.987°
16	12 days	–0.9305°	–0.9675°
13	13 days	–0.971°	–0.987°
6	14 days	–1.0885°	–1.117°
	Average	–0.9439°	–0.9600°

Market Veal—Freezing Point.

No.	Loin.	Round.
1	–1.158°	–1.240°
2	–1.085°	–1.111°
3	–1.192°	–0.923°
4	–1.234°	–1.035°
5	–1.0405°	–1.0645°
6	–1.045°	–1.1315°
7	–1.0125°	–1.0055°
8	–1.087°	–1.123°
9	–1.159°	–1.091°
10	–0.980°	–1.130°
11	–1.101°	–0.9045°
12	–1.0015°	–1.082°
13	–1.0515°	–1.1165°
14	–1.0205°	–1.1045°
15	–1.0655°	–1.1095°
16	–0.9910°	–1.055°
17	–0.9485°	–1.079°
18	–1.0975°	–1.1155°
19	–1.019°	–1.124°
20	–0.961°	–1.092°
21	....	–1.090°
Average	–1.0625°	–1.0822°

Beef—Freezing Point.

No.	Loin.	Round.
1	–1.069°	–1.051°
2	–1.142°	–1.044°
3	–1.175°	–1.018°
4	–1.1495°	–1.311°
5	–0.970°	–1.052°
6	–1.054°	–1.0785°
7	–0.963°	–1.0725°
8	–0.917°	–1.013°
9	–1.1455°	–1.037°
10	–0.977°	–1.108°
11	–1.175°	–1.041°
12	–1.0105°	–1.0305°

BEEF — FREEZING POINT —(*Continued*).

No.	Loin.	Round.
13	–1.047°	–1.049°
14	–1.107°	–1.057°
15	–0.9905°	–1.109°
16	–1.0665°	–1.0545°
17	–1.040°	–1.099°
18	–1.179°	–1.079°
19	–1.0675°	–1.060°
20	–0.994°	–1.125°
21	....	–1.095°
22	....	–1.177°
Average	–1.06195°	–1.080°

SUMMARY OF THE FREEZING POINT EXPERIMENTS.

	Loin.	Round.
Bob veal	–0.9439°	–0.9600°
Market veal	–1.0625°	–1.0822°
Beef	–1.06195°	–1.0800°

BOB VEAL — SPECIFIC GRAVITY.

Age.	Loin.	Round.
1 day	1.023	1.033
3 days	1.026	1.025
4 days	1.027	1.020
5 days	1.027	1.027
6 days	1.025	1.025
6 days	1.027	1.030
7 days	1.027	1.032
8 days	1.018	1.020
9 days	1.030	1.032
10 days	1.028	1.025
11 days	1.020	1.030
12 days	1.031	1.033
13 days	1.032	1.032
14 days	1.028	1.030
Average	1.0263	1.0281

MARKET VEAL—SPECIFIC GRAVITY.

No.	Loin.	Round.
1	1.029	1.040
2	1.035	1.030
3	1.035	1.035
4	1.032	1.033
5	1.035	1.035
6	1.032	1.032
7	1.034	1.035
8	1.038	1.031
9	1.032	1.037
10	1.034	1.032
11	1.027	1.035
12	1.027	1.045
13	1.032	1.034
14	1.028	1.037
15	1.028	1.032
16	1.032	1.033
17	1.025	1.027
18	......	1.034
Average	1.0314	1.0342

BEEF—SPECIFIC GRAVITY.

No.	Loin.	Round.
1	1.030	1.034
2	1.035	1.028
3	1.035	1.030
4	1.035	1.035
5	1.035	1.038
6	1.030	1.033
7	1.027	1.032
8	1.032	1.032
9	1.035	1.032
10	1.032	1.034
11	1.033	1.027
12	1.030	1.034
13	1.032	1.032
14	1.033	1.040

BEEF — SPECIFIC GRAVITY — (*Continued*).

No.	Loin.	Round.
15	1.023	1.037
16	1.030	1.035
17	1.033	1.033
18	1.027	1.028
19	......	1.027
20	......	1.035
Average	1.0315	1.0328

SUMMARY OF THE SPECIFIC GRAVITY TABLES.

	Loin.	Round.
Bob veal	1.0263	1.0281
Market veal	1.0314	1.0342
Beef	1.0315	1.0328

BOB VEAL — PERCENTAGE OF WATER.

	Loin.	Round.
	78.48%	78.17%
	77.55%	78.75%
	81.19%	80.89%
	79.37%	77.86%
	77.77%	79.21%
	76.36%	78.43%
	73.81%	75.98%
	76.63%	77.16%
	74.81%	76.60%
	.....	78.41%
	79.40%	78.92%
	77.83%	77,96%
	71.81%	81.31%
Average	77.08%	78.43%

Market Veal — Percentage of Water.

	Loin.	Round.
	63.03%	75.64%
	70.94%	71.04%
	73.48%	78.43%
	74.21%	73.56%
	77.50%	75.97%
	79.10%	78.32%
	75.26%	75.00%
	83.19%	72.39%
	77.05%	75.86%
	76.80%	76.63%
	77.20%	74.77%
	74.75%	75.29%
	75.98%	75.49%
	78.31%	77.32%
	75.27%	75.95%
	77.93%	75.26%
	77.90%	......
Average..	75.87%	75.43%

Beef — Percentage of Water.

	Loin.	Round.
	70.69%	74.96%
	69.30%	70.99%
	76.20%	77.06%
	74.18%	59.40%
	77.78%	73.47%
	75.81%	77.33%
	72.85%	55.08%
	77.14%	76.82%
	69.28%	74.50%
	72.27%	72.54%
	72.76%	70.43%
	72.82%	73.49%
	74.63%	74.44%
	75.07%	74.47%
	74.19%	71.42%
Average..	73.66%	71.76%

SUMMARY OF TABLES OF PERCENTAGE OF WATER.

	Loin.	Round.
Bob veal	77.08%	78.43%
Market veal	75.87%	75.43%
Beef	73.66%	71.76%

SUMMARY OF ALL THE TABLES.

	BOB VEAL.		MARKET VEAL.		BEEF.	
	Loin.	Round.	Loin.	Round.	Loin.	Round
Freezing point	-0.9439°	-0.9600°	-1.0625°	-1.0822°	-1.06195°	-1.080°
Specific gravity	1.0263	1.0281	1.0314	1.0342	1.0315	1.0328
Percentage of water.	77.08%	78.43%	75.87%	75.43%	73.66%	71.76%

In analyzing the tables, a general correspondence is noted in respect to the averages of the freezing point, specific gravity and percentage of water. In the bob veal where more water is present in the tissues, there is less depression of the freezing point, a lighter specific gravity and a greater percentage of water. In the market veal and beef, there is a greater depression of the freezing point, greater specific gravity and a less percentage of water. Although there is this general uniformity as regards the averages there are numerous individual instances in which it does not exist. Of these various methods the freezing point has appeared to be the most sensitive and is, therefore, considered to be the most reliable.

There are certain conditions which may influence the results in experimental work of this kind. The amount of moisture in the tissue may be increased or decreased. If the meat has been frozen or kept in a cold temperature and then brought into a warm temperature it is quite probable that some of the juice will escape from the meat and the freezing point of what further juice may be obtained will have a freezing point lower than that which might have been expected from the original juice. If, on the other hand, the conditions of temperature and moisture are right, the tissue may absorb moisture and the freezing point in that event should not be depressed so much.

An experiment was tried along this line by allowing samples from the round of the market veal and beef to remain exposed to the ordinary temperature in a basement room for three days during the month of July. A portion of the meat was used each of the three days and its freezing point determined. The following tables show the results obtained:

MARKET VEAL.

July 13.	Freezing point	—1.091°
14.	Freezing point	—1.141°
15.	Freezing point	—1.150°

BEEF.

July 13.	Freezing point	—1.108°
14.	Freezing point	—1.174°
15.	Freezing point	—1.102°

The figures would indicate that in the case of the veal moisture was lost continuously as the freezing point was depressed each day. In the case of the beef it would appear that moisture was lost between the first and second days as shown by the lower freezing point, but that between the second and third days enough moisture had been absorbed so that the freezing point was not depressed quite so much as it was on the first day.

Another fact which should be taken into account is the condition of the calf at the time of birth. If it be premature and is born two or three weeks before it is normally due, then the tissues naturally could not be expected to be so mature as those of a normal calf. Yet such a calf four weeks after its premature birth may be sold as veal under the New York State law, while if its birth had been delayed until the normal time, the law would require the usual four weeks to elapse before the veal could be put on the market. If on the other hand the calf is not born until two or three weeks after it is due, we must consider that during this period of extra retention in the uterus, its tissues are still growing and developing in vigor. If the calf has run three weeks overtime is it, one week after its birth, still bob veal? It is under the law and yet it may have gone as far in development as the prematurely born calf which the law permits to be sold four weeks after its birth although this only brings it to about the time when its birth should have normally occurred.

The law governing the sale of veal varies in different countries. In some parts of Germany veal may be offered for sale eight or ten days after birth; in other parts two weeks must have elapsed from the time of birth. In Great Britain it is said (A. R. Littlejohn, Meat and Its Inspection) that "calves are seldom killed for meat before five weeks old, and never should be slaughtered before two weeks old." In this country the Federal law provides that the calf must be three weeks of age (it was formerly four weeks). In the different States the laws vary from three weeks in New Jersey and Pennsylvania to six weeks in Arkansas and Missouri. In a number of other States the laws prescribe four weeks. It would appear that in some portions of this country there has been a tendency to reduce the minimum age at which the veal may be offered for sale, and there is not much question but that uniform laws with an age limit similar to that fixed by the Federal government would mark a decided step in advance. It is not at all improbable that it may be desirable to reduce the minimum age to that fixed by Germany or even lower if it cannot be proven that the veal is unwholesome or unpalatable.

The dietetic experiments have been continued. Seven families, including more than twenty persons, have co-operated at various times in this part of the investigation by eating a portion of the veal. Children from two years up have partaken of the flesh and have apparently enjoyed it as well as the elders. The families were ready to receive a portion of a carcass when it became available. In none was there any evidence that could be detected of any detriment or disturbance of the normal physiological processes of the body. Although the range of persons included children of tender years up to those well along in maturity not a single complaint of distaste or injurious effect has been received. The claim that the flesh of very young animals has a laxative effect upon human beings (Walley) has not been verified in the present experiments. Because of the lack of the fat in the immature animals, it has been found that the flesh is apparently rendered more palatable if this deficiency is supplied by cooking the veal with pork or other fat.

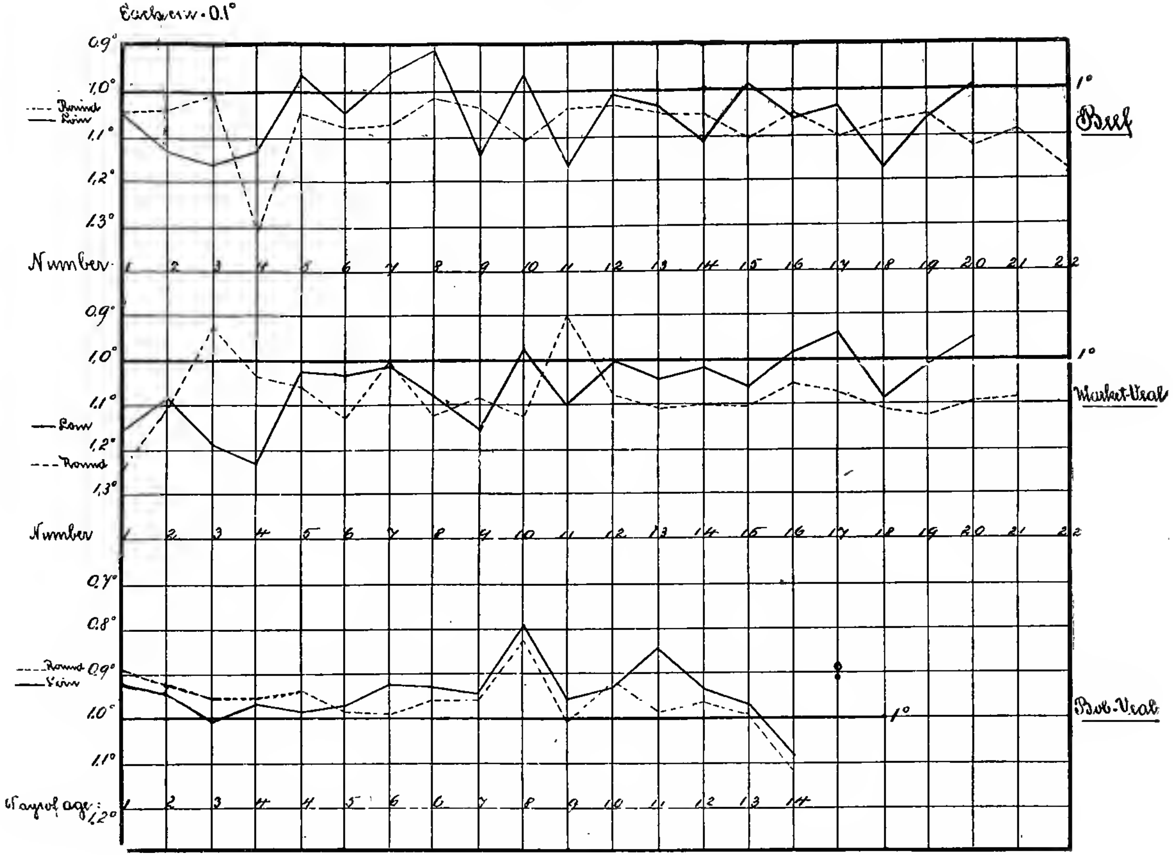
The fact that carcasses are occasionally seized as bob veal by officials indicates that there is more or less of an attempt to substitute immature for mature veal. Undoubtedly the attempt is sometimes successful. It such a case there is not much doubt that many people, ignorant of its character, would eat bob veal with a relish, who would disdain to touch it if they were informed of its true character in advance. With some there is an idiosyncrasy against veal whether it be mature or immature, as there may be with others against oysters, clams or other articles of food. There is, however, among many foreigners a demand for bob veal; others, financially poor, would undoubtedly use it, since it could be put on the market for a lower price than mature veal. There can be no harm in legalizing the sale of bob veal if it is properly labeled to prevent substitution and so that those who wish it may procure it. As to the charge of unwholesomeness or deleterious effect upon the human system, the burden of proof rests upon those who put forth such claims; our own experiments thus far show to the contrary. Such a law would bring meat into the homes of the poor where it is now absent or but rarely used. It would also reduce the attempts, under the present law, to substitute immature for mature veal.

The economic side of the question is of the highest significance because it bears upon the conservation of the meat supply. To the honest farmer who does not care to raise veal to maturity there must be considerable loss. The skin may be sold, but in the absence of any knowledge of the nutritive value of the flesh, which the present law tends to confirm, the rest of the carcass is usually thrown away or cooked up and fed to the poultry or swine. Doubtless many thousand dollars worth of food of a definite nutritive value goes to waste in this way in the State of New York as well as many other States.

Such a waste should be considered very seriously when statistics show an increasing population with a diminishing meat supply.

The following tables compiled from the year book of the U. S. Department of Agriculture show the conditions existing as to milch cows and other cattle with their value in New York State and the United States. (See also Plates II, III and IV.)

Plate I



Curves showing the freezing point of the tissues of the beef, market veal and bob-veal.

The heavy line across each curve represents 1.0 degree.

Plate II

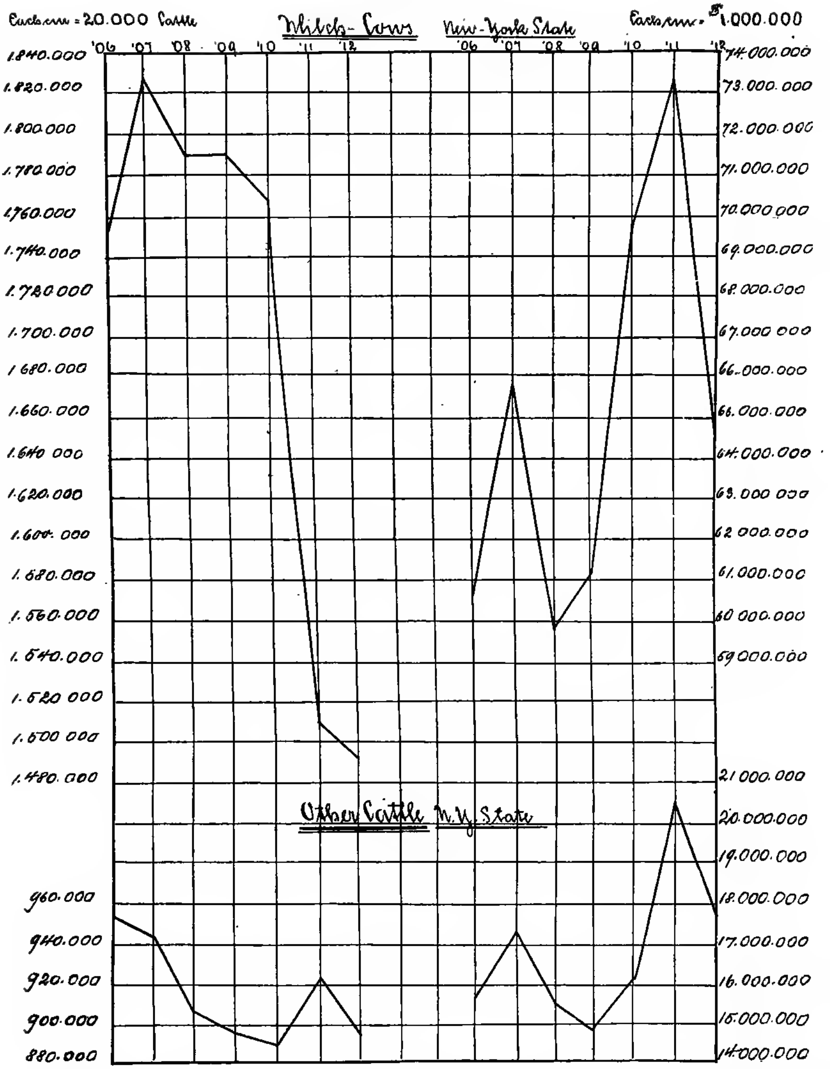


Diagram showing the number (left) of milch cows (above) and other cattle (below) with the farm value (right) in the State of New York from January 1, 1906 to January 1, 1912

(Data from the U. S. Dept. of Agriculture)

Plate III

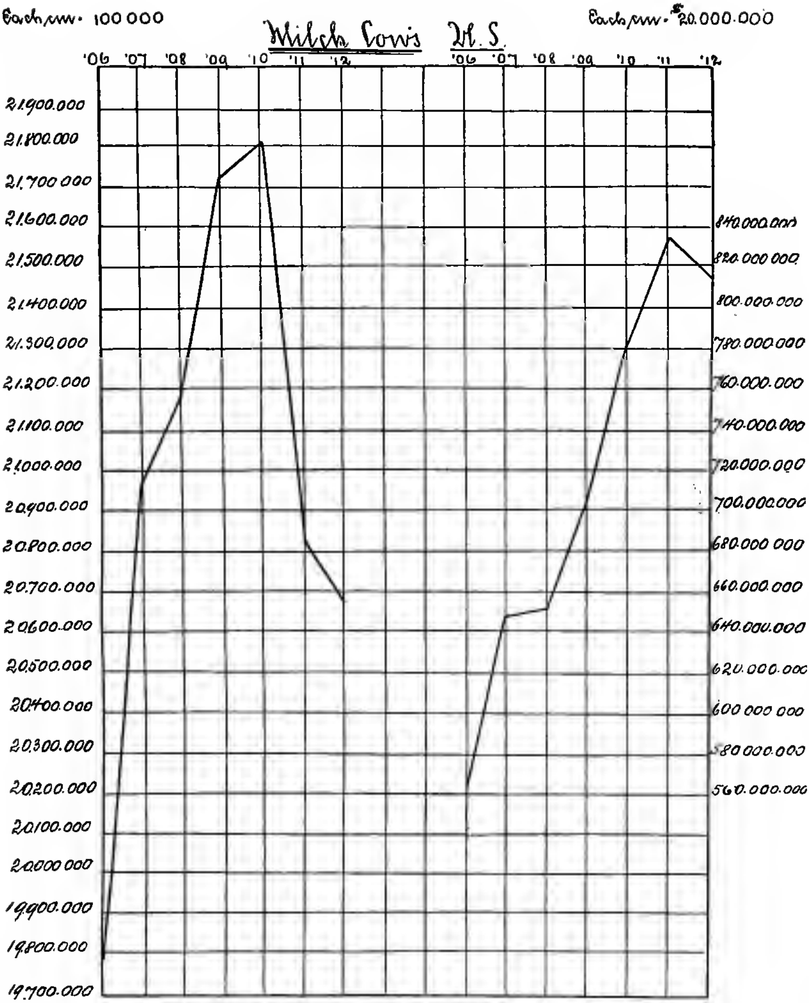


Diagram showing the number (left) and farm value (right) of milch cows in the United States from January 1, 1906 to January 1, 1912
(Data from the U. S. Dept. of Agriculture)

Plate IV

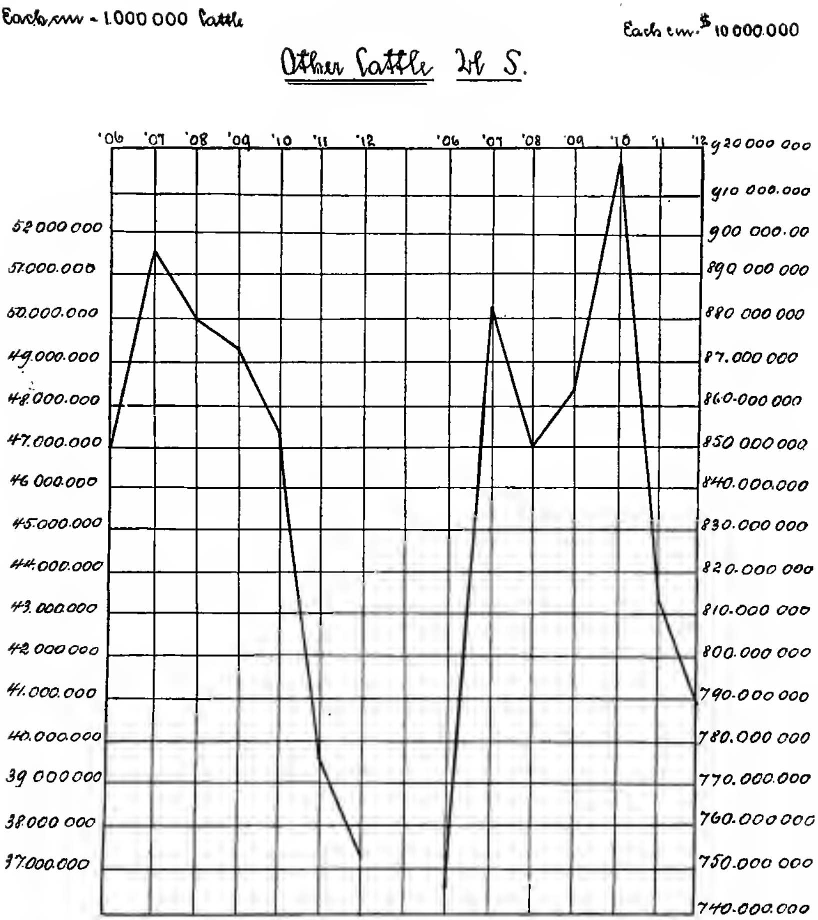


Diagram showing the number (left) and farm value (right) of other cattle in the United States from January 1, 1906 to January 1, 1912

(Data from the U. S. Dept. of Agriculture)

NEW YORK STATE.

Year.	No. of milch cows.	Farm value.
Jan. 1, 1906	1,755,972	$60,581,034
" 1907	1,826,211	65,743,596
" 1908	1,789,000	59,932,000
" 1909	1,789,000	61,273,000
" 1910 , ...	1,771,000	69,954,000
" 1911	1,510,000	73,235,000
" 1912	1,495,000	64,734,000

Year.	No. of other cattle.	Farm value.
Jan. 1, 1906	954,277	$15,764,647
" 1907	944,734	17,307,526
" 1908	907,000	15,419,000
" 1909	898,000	14,817,000
" 1910	889,000	16,180,000
" 1911	922,000	20,468,000
" 1912	894,000	17,701,000

UNITED STATES.

Year.	No. of milch cows.	Farm value.
Jan. 1, 1906	19,793,866	$582,788,592
" 1907	20,968,265	645,496,980
" 1908	21,194,000	650,057,000
" 1909	21,720,000	702,945,000
" 1910	21,801,000	780,308,000
" 1911	20,823,000	832,209,000
" 1912	20,699,000	815,414,000

Year.	No. of other cattle.	Farm value.
Jan. 1, 1906	47,067,656	$746,171,709
" 1907	51,565,731	881,557,398
" 1908	50,073,000	845,938,000
" 1909	49,379,000	863,754,000
" 1910	47,279,000	917,453,000
" 1911	39,679,000	815,184,000
" 1912	37,260,000	790,064,000

Such statistics emphasize the necessity for the conservation of the meat supply in both the State and Nation. If, as in the past, it has been found wise to reduce the killing age of beef from seven years to the one or two years of " baby " beef, then in the future, in view of the diminishing supply and increasing cost of meat, it may also be found wise to remove some of the restrictions which surround bob veal.

In conclusion I desire to express my appreciation of the assistance rendered by C. E. Hayden who has done practically all of the mechanical work involved in the experiments and to whose patience, skill and accuracy my data are due.

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PRELIMINARY OBSERVATIONS ON BOB VEAL.

BY

~~F~~. A. FISH.
P.

PRELIMINARY OBSERVATIONS ON BOB VEAL.

PIERRE A. FISH

Department of Veterinary Physiology.

Is the flesh of calves from birth to three or four weeks of age harmful to the consumer when used as food? The law prohibits its sale for such a purpose. The intent of the law is to safeguard the consumer. Does it accomplish its purpose and does it work any hardship to the producer? Does it pay to convert milk and grain into veal four or more weeks of age? Granting that some calves are born in a more mature condition than others, is there any method by which the flesh of bob veal can be positively identified from the flesh of older veal? Such a method would be of great value in aiding the prosecution when the law has been infringed, and, if the bob veal is really injurious, in protecting the public from its use. Under the present conditions of an increasing population and a diminishing beef supply these questions are of considerable interest and indicate that some attention must be devoted to the conservation of the meat supply if it is to continue to form one of the staples of the diet, especially of the poor.

Introduction. It seems to be a fact that domestic live stock has been developed to the highest state of perfection in those countries in which meat is most used as a food. The food question has given special impetus to specialization in the breeding and feeding necessary to increase the excellence in the flavor, grain and quality of the meat.

In the reign of Henry the VIII, it is stated that the cattle industry was grossly neglected, and that the consumption of beef was confined principally to the summer months. At that time beef sold for the equivalent of three cents (of our present money) per pound.

The diminutive cattle of that period, as compared with modern breeds, were little adapted for the production of choice meat. A still further difficulty in the production of choice meat was the custom of keeping an animal from five to seven years before considering it fit for the market, and for the greater portion of this time requiring the animal to work, instead of grazing, in the fields. Under such conditions it is apparent that the beef produced could not be otherwise than tough and inferior and lacking the juicy quality which is now so much desired. Later when there developed some specialization in growing cattle especially adapted for beef production, more attention was devoted to developing size and quantity rather than quality.

At the beginning of the nineteenth century the standard of perfection in this country and in England was the steer of five or six years of age. Even in the early eighties a steer was not deemed mature or profitable enough for slaughter until four or five years old and was of large size and weight.

Since 1891 finished steers more than three years of age have been the exception rather than the rule on the markets, while two-year-olds are gradually becoming the maximum.* With the reduction in age came a reduction in size, which brought out as the butchers' ideal animal the "pony" beef, an animal weighing from 1200 to 1400 pounds when fully finished. "Pony" beef was eventually followed by "baby" beef — practically a pony steer finished at a younger age.

As defined by Ritzman,* baby beef is a prime butcher's beast, thoroughly fattened and ripe for the block at from 12 to 24 months of age. Growth has been artifically promoted by continuous heavy feeding from birth, with the object of obtaining in the shortest time possible the maximum amount of well-matured beef. The customary ages at which cattle are put on the market are as 2-year-olds or 3-year-olds, the greater part of the time being required for natural growth, while about four to six months at the end are devoted to fattening. In the production of baby beef the fattening process is begun at birth and carried on simultaneously with growth. In order to make calves thoroughly prime and fit for the block as yearlings it is absolutely essential that they be always fed to the limit of their ability of transforming food into beef.

Baby beef is a special article in which the essential characteristics are early maturity, quality, finish and thickness of flesh.

The first step toward baby beef was the demand for the production of smaller and more compact animals, already referred to as pony beef. The butchers claimed that this change was a good one for economical reasons, because small, compact carcasses cut up with less waste fat and furnish the thick, light steaks most in demand by the consumer.

Again, experimental evidence shows that young animals will feed more economically than those more mature in age, so that baby beef will give from 25 to 50 per cent. more meat for the grain consumed than the same animal would if kept until two or three years of age. This was the economical solution of the problem of cheapening the production of meat. Therefore the greater profit in small joints, together with the greater economy of producing young beef, may be regarded as the most potent factors in the bringing about of baby beef. The weight of the animal usually ranges from 800 to 1000 pounds.

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* E. G. Ritzman, *Circular* 105, *Bureau Animal Industry.*

The flesh of young cattle, when compared with that of old steers, is brighter in color. It has not developed that coarseness of grain and fiber characteristic of the flesh of old animals, and is therefore more tender and delicate. The proportion of fat to lean is less in the young animals and the fat does not accumulate in such large deposits, or masses between the layers of muscle, but is more evenly distributed in flakes between the muscle fibers. The flesh of young cattle contains a greater amount of water, which, as the animal grows older, is partly replaced by fat.

The following data are taken from a portion of a table compiled by Ritzman from Bulletin No. 28, Office of Experimental Stations.

	WATER.		PROTEIN. (N. x 6.25).		FAT.		FUEL VALUE, PER POUND.	
	Beef.	Veal.	Beef.	Veal.	Beef.	Veal.	Beef.	Veal.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*	
Loin, average analyses	61.3	69.5	19.0	19.9	19.1	10.0	1,155	790
Round or leg, average analyses	67.8	71.7	20.9	20.7	10.6	6.7	835	670

There is very little difference in the relative amount of protein in the beef and veal, but such as it is, is in favor of the veal. The smaller amount of fat in the veal seems to be replaced by the additional amount of water. The caloric values are decidedly in favor of the beef, but if the same amount of fat were present in the veal we should expect the same amount of nutritive efficiency as from the beef.

Laws relative to bob veal. There is a federal law prohibiting the use of bob veal for food. Many of the states have a similar law. Formerly the federal law prohibited the use for food of calves less than four weeks old. In 1906 a change was made in the Meat Inspection Laws, so that it is now provided that the meat shall not be used if the calf is under three weeks of age. The writer is informed that the states of New Jersey and Pennsylvania have laws in accordance with the federal law. New York and at least twelve* other states retain the old federal law, requiring that the calf shall be at least four weeks old. In Arkansas and Missouri the law requires that the meat from calves killed under six weeks of age must not be sold for food.

The question of enforcing the law is of paramount importance. The most dependable sign in determining a bob calf is the unhealed condition of the umbilicus. The value of this sign however is limited to the living or undressed carcass of the calf. Under normal conditions this area heals shortly after birth and is not of much diagnostic value except in the first few days. The absence of fat around the kidneys (renal fat) is also a sign of more or less value; but the time at which the fat begins to be deposited about the kidneys — or other parts — is quite variable and depends largely upon nourishment and idiosyncrasy. These signs can be of little value after the carcass has once been skinned and cut up for market uses.

Inspectors in observing the dressed carcasses of calves, one, two, three or four weeks of age are confronted with many difficulties in determining with any degree of exactness the precise age of the animal. Size and weight are not to be depended upon, the color and consistency of the flesh are not by any means infallible. The reason for this is that many calves are born in a more mature condition than others and it is not unusual in some instances to find that a calf shortly after birth may weigh as much and possess flesh of as firm consistency as another calf a week or more old. These conditions complicate matters when the law is evaded and the desirability of exact data, if such be possible, in courts of law is self evident.

Experimental. The writer has undertaken an investigation relative to bob veal, which is as yet incomplete. Some data have been obtained which seem to be of sufficient interest to make it desirable to offer a preliminary communication at this time.

The purpose of the investigation has been to obtain, if possible, from the tissues themselves some evidence as to the relative age of the animal and further to determine if the flesh of the young calf from one to fourteen days exerts any detrimental effect upon the consumer when used as a food.

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* **Florida, Illinois, Indiana, Maine, Massachusetts, Nevada, New Hampshire, North Dakota, Oregon, Rhode Island, South Dakota and Vermont.**

Some five years ago the writer made a few preliminary experiments in an effort to determine if some definite data could not be obtained to show that a larger proportion of glycogen was present in the tissues of the young animal and if this would vary with the age. The results were not promising and the work was not continued.

In the present work efforts have been made to follow the period of early growth by determining the proportion of fluid and solid contents of the tissues. The young tissues contain a larger percentage of water than mature tissue. To obtain this data the following methods have been employed: the determination of the freezing point of the juice expressed from the tissues; the specific gravity of such juice; the percentage of water lost from the tissue after dessication; the determination of the coagulation point of the tissue juice.

Three series of tissues were used in the experiments. The first series consisted of the bob veal ranging from one to fourteen days in age. The second was market veal as purchased in the butcher shop. Although it may be impossible to guarantee that there was no bob veal in this series, the dealer's assurance was given that he handled no veal from a calf less than four weeks of age. The third series was the beef as obtained at the market. The parts purchased were from the loin and round. Parts from similar regions were taken in the case of the bob veal.

As obtained the tissue juice was really the muscle juice mixed with any blood or lymph that may have been present in the tissue and the data is therefore representative of this mixture rather than pure muscle juice. Since the tissues of all the series were subjected to the same procedure throughout the experiments, the results should stand on a relatively equable basis.

The principle involved in the experiments is that the freezing point of the fluid is depressed in proportion to the amount of solids contained therein. The standard of comparison is distilled water in which no solids exist. The fewer solids in the fluid under examination the nearer should its freezing point be to that of distilled water, and conversely with more solids present the more should the freezing point be depressed. Since the tissue of the bob veal is supposed to contain more water than that of beef, the freezing point of the former should not be lowered so much as that of the latter.

The following table shows the freezing point of the bob veal tissue thus far examined:

BOB VEAL.

Calf No.	Age.	Loin.	Round.
1.	Two days........	—1.147°	—1.100°
2.	Twenty hours	—0.923°	—0.894°
3.	Four days	—0.965°	—0.959°
4.	Six days	—0.924°	—0.9855°
5.	Eight days	—0.795°	—0.826°
6.	Fourteen days	—1.0885°	—1.117°
7.	Eleven days	—0.849°	—0.987°
8.	Four days	—0.972°	—0.942°
9.	Six days	—0.9345°	—0.962°
	Average	—0.9553°	—0.9747°
	Combined average of loin and round..		—0.965°

In the above table the samples from the loin and round were taken from the same carcass. In the market veal and beef it is more than probable that the loin and round came from different carcasses.

MARKET VEAL.

	Loin.	Round.
	—1.158°	—1.240°
	—1.085°	—1.111°
	—1.192°	—0.923°
	—1.234°	—1.035°
Average..	—1.167°	—1.077°
Combined average of loin and round.		—1.122°

BEEF.

	Loin.	Round.
	—1.069°	—1.051°
	—1.142°	—1.044°
	—1.175°	—1.018°
	—1.1495°	—1.311°
Average..	—1.1338°	—1.106°
Combined average of loin and round.		—1.1199°

An examination of the tables shows that as between the loin and round there is some fluctuation as to the freezing point although the average freezing point of the round is depressed a trifle more than the loin in the bob veal, the reverse is true of the market veal and beef. The differences are slight and probably have no special significance.

The combined average of the loin and veal in each of the three series is, however, interesting in that it shows for the eighteen samples of the bob veal (under fourteen days of age) that the total average freezing point is depressed, — 0.965°, a little less than one degree, while similarly in the fewer samples of the market veal and beef the freezing point is depressed a little more than one degree.

The specific gravity was obtained from the same tissue juice that was used in the freezing point experiments. The pycnometer was employed for this purpose on account of its convenient use where only a small amount of fluid is available for the determination of its specific gravity.

The fluid was introduced into a bulb at the end of the instrument and the whole submerged in a jar of distilled water. The reading was then taken from the scale of the instrument.

SPECIFIC GRAVITY. BOB VEAL.

	Loin.	Round.
	1.023	1.033
	1.027	1.020
	1.025	1.025
	1.018	1.020
	1.028	1.030
	1.020	1.030
	1.023	1.026
	1.027	1.030
Average..	1.0238	1.0267
Combined average of loin and round.		1.0252

SPECIFIC GRAVITY. MARKET VEAL.

	Loin.	Round.
	1.029	1.040
	1.035	1.030
	1.035	1.035
Average..	1.033	1.035
Combined average of loin and round.		1.034

Specific Gravity. Beef.

	Loin.	Round.
	1.030	1.034
	1.035	1.028
	1.035	1.030
	1.035	1.035
Average..	1.0337	1.0317
Combined average of loin and round.		1.0327

Percentage of Water. Bob Veal.

	Loin.	Round.
	78.48%	78.17%
	77.55%	78.75%
	81.19%	80.89%
	79.37%	77.86%
	77.77%	79.21%
Average..	78.87%	78.97%
Combined average of loin and round.		78.92%

Percentage of Water. Market Veal.

	Loin.	Round.
	63.03%	75.64%
	70.94%	71.04%
	73.48%	78.43%
	74.21%	73.56%
Average..	70.16%	74.66%
Combined average of loin and round.		72.41%

Percentage of Water. Beef.

	Loin.	Round.
	70.69%	74.96%
	69.30%	70.99%
	76.20%	77.06%
Average..	72.06%	74.33%
Combined average of loin and round.		73.19%

The coagulation experiments have not as yet been sufficiently worked out and are therefore withheld.

Summary of the experiments. A summary of the combined averages of the freezing point, specific gravity and percentage of water for the three series is herewith given:

	Bob Veal.	Market Veal.	Beef.
Freezing point	— 0.965°	— 1.122°	— 1.1199°
Specific gravity . . .	1.0252	1.034	1.0327
Percentage of water.	78.92%	72.41%	73.19%

Although it is appreciated that the number of specimens from which these averages were obtained is insufficient, a comparison of the result shows that, under the conditions of the experiments, there is a correlation between the freezing point, specific gravity and percentage of water in each series. In the bob veal there is less depression of the freezing point, a lighter specific gravity and a greater percentage of water.

In the market veal and beef there is a greater depression of the freezing point, a greater specific gravity and a lower percentage of water.

With data from a greater number of specimens a more reliable average may be obtained which may serve as a fairly accurate standard for comparison in differentiating the younger bob veal from the market veal.

Mitchell* quoting from Katz, gives the percentage of water present in the flesh of the ox as 75.80% and in the calf as 75.39%. The same author quoting from Koenig gives the following, representing the mean results of the analyses of different chemists:

Ox	very fat	53.05%
	medium	72.03%
	lean	76.37%
Cow	fat	70.96%
	lean	76.35%
Calf	fat	72.31%
	lean	78.82%

Dietary experiments. After removing sufficient of the veal for the experiments, the remainder of the carcasses of the nine bob calves were cut up and used as food. Three, and at times four, families cooperated in this part of the investigation. In one of the families there were children ranging from four to twelve years of age. All partook of the veal and appeared to relish it. None of the families reported any disturbance of any of the bodily functions; the health was apparently normal and each family was ready to receive a portion whenever another carcass was available.

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* Flesh Foods, C. Ainsworth Mitchell.

The nutritive value of veal is high as regards the proteid but deficient in fat. This deficiency may be rectified to some extent by the use of fat in the process of cooking or serving it with the veal. Bob veal has a sweet but perhaps not so distinctive a flavor as market veal and is not so stringy. Although it can be roasted it is not so satisfactory as the older veal. It can be fried and its palatability is excellent when stewed with pork. There is not, of course, as great a proportion of meat to the bone as in the older veal and this perhaps renders it somewhat less effective as a roast.

Practices in foreign countries. It is said to be the custom in certain localities in one of the foreign countries that when the time approaches for the cow to give birth to her young or to " slink her calf," the peasant women endeavor to catch the newly born calf in their aprons in order that they may boast that they have eaten of a calf that has never touched the stable floor, such food being considered a very great delicacy.

Customs vary greatly in the different countries. Of the various foreign countries, Germany has probably given as much attention to this phase of the question as any other country and the following extracts from Wilcox's translation of Ostertag's work on meat inspection are therefore quoted.

" The meat of immature calves — that is, those which are killed during the first week of life is of a lighter color than that of older calves, of a higher water content and of a softer consistency. The muscles, especially those of the hind quarters, are still only slightly developed, and the finger easily penetrates them. *Rigor mortis* is very inconspicuous. The adipose tissue, which is present, possesses a jelly-like consistency."

"Animals are characterized as immature until they have reached the age of from 8 to 14 days. Until this age, according to the view of most meat consumers, animals are not ripe or mature for the table. * * * * During the first 8 to 14 days after birth, animals exhibit a poorly developed, gray-red, flabby, strongly water-soaked musculature. * * * * The subjective ideas concerning immaturity exhibit great local variations. For example, while in South Germany a minimum age of 3 to 4 weeks is demanded for the slaughter maturity of calves, in other regions as in Mecklenburg and Holstein, calves from 2 to 3 days old are much sought after. In Berlin, calves from 6 to 8 days old furnished a highly prized food material. This is due to two circumstances. In the first place, intensive dairying, in which all calves not intended for rearing are quickly rejected, has introduced a custom to which meat consumers in the course of time adjusted themselves. Furthermore the price of immature, or fasting, calf meat is naturally less than that of older calves, so that it becomes possible for persons of moderate means to eat veal — a luxury which would otherwise be denied them. Finally by the art of preparation, especially by the plentiful addition of fat, it is possible to improve the original condition, and in this manner to prepare a palatable food from immature veal. In the greater part of Germany, in common parlance, calf meat is understood to mean that which comes from calves at least 8 to 14 days.

"In the regulations of meat inspection and local ordinances, the following rules are laid down. Section II of the Baden meat inspection regulations of November 26, 1878, provides that the meat of calves under 14 days of age, shall not be regarded as marketable. An ordinance concerning compulsory slaughter in Dessau prescribes that only calves over 10 days old and a minimum weight of 45 kg. (99 lbs.) can be slaughtered. In Interburg, Rastenburg and Swinemunde, the meat of animals under 8 days old is excluded from the market. Special ordinances forbid the sale of calves in which the navel has not healed. In Stolp and Haynau the matter is decided according to each individual case; likewise in Berlin. Here there is no minimum age limit for the admission of calves for food, but in each individual case the development and consistency of the musculature are the deciding factors. Calves in which the stump of the umbilical cord has not become united with the navel are regularly excluded from the market."

"The meat of immature calves is not harmful. Occasionally the opinion is held that immature veal exercises a peculiar, characteristic, physiological action on the human organism, causing the occurrence of diarrhoea and illness. This opinion is, scientifically, without foundation. (Schmidt-Mulheim.) On the other hand, immature meat is a spoiled food material and is only to be admitted for sale under declaration. Its unfit character appears from the incomplete development of the meat and from the subjective repugnance of the majority of meat consumers toward it.

"In regard to the latter point, it is necessary to consider the difference in custom in different regions."

"Meat of foetuses. The meat of foetuses is never a marketable food material. Only among English gourmands is the meat of foetuses considered a delicacy, as was the case among the Romans. In localities, however, without regular meat inspection, all strongly developed bovine foetuses are falsely offered for sale in the form of bratwurst."

"According to a decision of the Second Criminal Senate of the Imperial Court, of January 3, 1882, the meat of calf foetuses (so-called unborn calves) is to be considered as an unfit food material, because the normal condition is not present but not only this fact but also the character of the object itself stamps foetal meat as unfit food material. The meat of foetuses is, moreover, in all civilized countries, considered as highly unfit for human food, for aesthetic reasons, and is excluded even from qualified sale under declaration."

Economics. The history of beef as a food shows that the tendency has been to reduce the age at which it might be eaten. In the early days there was probably as much prejudice against eating beef that was two, three or four years old as there is now against eating veal less than four weeks of age. There appears to have been a very considerable lack of serious investigation into the question of the nutritive use of young veal. Old ideas based, perhaps, on idiosyncrasy and ignorance of nutritive values may be responsible, in many localities, for the rejection of material that has a definite nutritive value although not so complete as more mature flesh.

The fact that the population of this country is increasing more rapidly than the meat supply, is worth considering in this connection. More mouths are to be fed and there must be conservation of the meat supply in order to meet the demands.

Rossiter* points out that according to the census of 1890, there were 57,649,000 neat cattle in the United States. In 1900, the number was but 52,489,000. Thus an actual decrease in cattle of over 9 per cent. occurred while the population increased 20.7 per cent. To have kept pace with the increase of population the number of neat cattle in 1900 should have been 17,200,000 greater than it was. Evidently the food supply, so far as cattle were concerned, failed to keep pace with the increased population. If this decrease has persisted from 1900 to 1910, while the population of the continental United States has, according to the recent census, increased 21 per cent., it may be reasonably assumed that the price of fresh meat will be still further advanced.

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* William S. Rossiter.—*Atlantic Monthly*, Dec. 1910.

The statistics published in the year book of the Department of Agriculture vary considerably from those given by Rossiter. For January 1, 1890, the year book gives the number of cattle in the United States as 52,791,907 which is near the number given by Rossiter for the year 1900 and is considerably less than his figures for 1890. For 1900 the year book places the number of cattle at 43,902,414 or 8,586,586 less than Rossiter's figures for the same year. Up to January 1, 1910, however, the year book gives the total number of cattle at 69,080,000 which is a gain of 30.8 per cent. over the number of cattle for 1890 and a gain of 57.3 per cent. for the figures given for January 1, 1900. Although, according to these figures, the number of cattle has increased rapidly during the last decade, the percentage of increase since 1890 has not been in proportion to the increase of population. Since 1890 the population of the continental United States has increased 41.7 per cent. while the number of cattle since that date has increased 30.8 per cent., still showing that the beef supply is not increasing in the same proportion as the population.

Further the year book shows that the number of cattle has been diminishing since 1907. For that year the statistics show the total number of cattle at 72,534,000 as against 69,080,000 in 1910, thereby showing a loss of 3,454,000 or a decrease within three years of about 4.7 per cent.

Although there has been considerable fluctuation in the number of cattle since 1890 the value has steadily increased. The following data from the year book shows the relation of the value to the number of cattle during this period.

Year.	Number of cattle.	Value.
1890......	52,791,907	$912,777,270
1900......	43,902,414	$1,204,298,366
1910......	69,080,000	$1,697,761,000

As is well known the cost to the consumer has been increasing rather than the reverse.

Is there a demand for bob veal? In most American cities there is a considerable population of foreigners: Polanders, Hungarians, Russians, etc. They have been accustomed to eating calves only a few days old in their native country. They knew what they were eating and wanted them. They would still eat them if available. From the standpoint of health and vigor these people appear to be up to the average. Why should not the law permit bob veal to be sold as such, plainly labeled, so that it may not be substituted for older veal? Substitution is deception and is distinctly illegal and should be summarily dealt with. Such veal could undoubtedly be sold for lower prices and since thus far there have not been shown any injurious effects following its consumption, the demand would doubtless, in time, extend to many others than foreigners.

Before the interstate commerce regulations were strictly enforced, there were undoubtedly many instances where calves three or more days old were sent to the market and farmers might contract their calves for two dollars apiece when they were three days old (the time at which the milk usually goes to the shipping station, after the sixth milking from the time of parturition). With the strict enforcement of the regulations there is no market for such calves and they are worth to the farmer only the price of the "deakin" skin, eighty cents to one dollar. Under these conditions the carcass of the young calf is a loss to the farmer unless he uses it in his own family as food. Since the law prohibits its sale to the public the natural inference among farmers, as others, would be that such meat is not only unwholesome but positively harmful. Analyses show, however, that the proteid value of veal is equal to that of beef. When the natural deficiency of fat in the young veal is supplemented by the addition of fat in the cooking or served with the meal, its nutritive value or palatability should be satisfactory to the average person. If it is a very general custom to sell only the hides of such young calves and throw away the carcasses, the amount of waste of food material of a certain nutritive value must be considerable.

For a time after birth the growing process is rapid and the major portion of the nourishment is undoubtedly utilized in this direction rather than in the storing up of fat; but even in this early condition if the calf be given all of the nourishment it can use its food value should be materially increased. Calves from one to four days old are not large enough or heavy enough to substitute for four weeks' old veal. Large fat calves from one to four weeks old are even now probably substituted for *light veals* four weeks old; but *prime* calves at four weeks of age have attained a weight and a covering of fat on the kidneys that place them in a class by themselves and very young calves have neither the weight or the fat to be substituted for *prime* veal.

At the present prices of milk and veal the following estimate may be offered of the necessary expense of an average veal:

Calf three days old	$1 00
Four quarts milk per day for first week, 28 quarts at 4c. per quart	1 12
Six quarts of milk per day for second week, 42 quarts at 4c. per quart	1 68
Eight quarts of milk per day for third week, 56 quarts at 4c. per quart	2 24
Ten quarts of milk per day for fourth week, 70 quarts at 4c. per quart	2 80
	$8 84
The calf should dress at 80 lbs. and net 12c. per lb.	9 60

On this basis it would appear that there is no loss involved in converting milk into veal. Opportunities for variation are considerable. Butter, cheese, crude milk and veal give about the same return and the price of milk is influenced by that of its products. The items of labor and transportation are factors that largely determine which route the milk will take.

The rejection of bob veal as a food merely because it has a larger proportion of water in its tissue than beef is not logical when we consider that such articles of diet as oysters with 80.5% of water, lobsters with 81.84% of water, crabs with 79.97% of water and such fish as the perch with 82.6% of water and the flounder with 84% of water are not only considered palatable but are regarded as delicacies and bring good prices in the market.

In closing this paper I wish to acknowledge the very material aid rendered by C. E. Hayden who has worked out the most of the determinations of the freezing point, specific gravity and percentage of water present in the specimens examined, also to Dr. G. W. Wheeler and others who have given information that has been of use to me.

Conclusions.

The determination of the freezing point of the tissue juice seems to offer a fairly promising method of differentiating the flesh of young bob veal from the older veal. The determination of the specific gravity and the percentage of water does not appear to have as much positive value but is perhaps useful as collateral evidence.

The use of bob veal as a food, by the families who participated in this portion of the investigation, shows that it was palatable and entirely harmless to the bodily functions so far as could be observed.

The reduction of the age limit of bob veal from four to three weeks by the State of New York would be along the line of progress. This has already been done by the federal government and the states of New Jersey and Pennsylvania are reported to have done the same. Further investigation may demonstrate the advisability of making a still further reduction especially if the increase of the meat supply does not keep up with the increase in population.

A law permitting the sale of bob veal, properly labeled as such, would in no way do injustice to the consumer or producer. If there is a demand for it; if it has not been demonstrated that harmful results follow its use; why should it not be supplied to those who may desire it?

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